In the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

1. (Original) In data transmission systems, a method for increasing payload capacities comprising the steps of:

determining a noise floor of a signal transmission system having a plurality of data bins;

determining a type of data modulation in the signal transmission system;

defining a desired bit-error rate (BER) associated with the signal transmission system;

calculating a linear signal-to-noise ratio (SNR) of each individual data bin of the plurality of data bins, the SNR being a function of the determined noise floor, the determined type of data modulation, and the defined desired BER;

comparing the calculated SNR of each individual data bin of the plurality of data bins to a predefined threshold SNR;

defining individual data bins in the plurality of data bins as sufficient-capacity data bins having sufficient capacity for data transmission in response to the calculated SNR of the individual data bin being greater than the predefined threshold SNR;

defining individual data bins in the plurality of data bins as insufficient-capacity data bins having insufficient-capacity for data transmission in response to the calculated SNR of the individual data bin being not greater than the predefined threshold SNR;

loading the defined sufficient-capacity data bins with data for data transmission;

clustering the defined insufficient-capacity data bins into bin-clusters having sufficient SNR for data transmission; and

transmitting data using the bin-clusters and the sufficient-capacity data bins.

2. (Original) The method of claim 1, further comprising the steps of:

receiving the transmitted bin-clusters and sufficient-capacity data bins;

extracting data from the sufficient-capacity data bins to produce desired data;

demodulating each bin-cluster to produce separated data bins;

applying a complex weight to each of the separated data bins to produce weighted data bins; and

summing the weighted data bins to produce desired data.

3. (Currently Amended) In data transmission systems, a method for increasing payload capacities comprising the steps of:

modulating data bins to produce bin-clusters, wherein a signal-to-noise ratio (SNR) of each individual data bin of a plurality of data bins is computed, the data bins are selectively clustered into bin-clusters having sufficient SNR for data transmission, wherein the computed SNR of each individual data bin of a plurality of data bins is compared with a predefined threshold SNR, and the individual data bins having a computed SNR not greater than the predefined threshold SNR are sequentially added to a bin-cluster until the linear sum of the SNR of each sequentially added individual data bin exceeds the predefined threshold SNR;

loading the bin-clusters with data;

transmitting the loaded bin-clusters;

receiving the transmitted bin-clusters; and

extracting data from the received bin-clusters.

4. (Original) The method of claim 3, wherein the data transmission system is a Fourier transform-based data transmission system.

5. (Original) The method of claim 3, wherein the data transmission system is a wavelet transform-based data transmission system.

6. (Original) The method of claim 3, wherein the data transmission system is a Haar transform-based data transmission system.

7. (Original) The method of claim 3, wherein the data transmission system is a Hadamard transform-based data transmission system.

8. (Original) The method of claim 3, wherein the data transmission system is a Walsh transform-based data transmission system.

9. (Original) The method of claim 3, wherein the data transmission system is a Walsh-Hadamard transform-based data transmission system.

10. (Original) The method of claim 3, wherein the data transmission system is a Mallat transform-based data transmission system.

11. (Original) The method of claim 3, wherein the data transmission system is a Hartley transform-based data transmission system.

12. (Original) The method of claim 3, wherein the data transmission system is a discrete cosine transform-based data transmission system.

13. (Original) The method of claim 3, wherein the data transmission system is a non-wavelet transform-based data transmission system.

14. (Original) The method of claim 3, wherein the data transmission system is a trigonometric transform-based data transmission system.

15. (Original) The method of claim 3, wherein the data transmission system is a non-trigonometric transform-based data transmission system.

16. (Cancelled)

17. (Currently Amended) The method of claim [[16]] 3, wherein the step of computing the SNR of each of the plurality of data bins comprises the steps of:

determining a noise floor of a signal transmission system;

determining a type of data modulation in the signal transmission system;

defining a desired bit-error rate (BER) associated with the signal transmission system; and

calculating a signal-to-noise ratio (SNR) of each individual data bin of the plurality of data bins as a function of the determined noise floor, the determined type of data modulation, and the defined desired BER.

18. (Cancelled)

19. (Original) The method of claim [[18]] 3, further comprising the steps of:

defining individual data bins of the plurality of data bins as sufficient-capacity data bins in response to the computed SNR of the individual data bin being greater than the predefined threshold of the comparing step; and

defining individual data bins of the plurality of data bins as insufficient-capacity data bins in response to the computed SNR of the individual data bin being not greater than the predefined threshold of the comparing step.

20. (Currently Amended) The method of claim 19, further comprising the steps of:

beginning a cluster pattern;

sequentially adding individual data bins having a computed SNR not greater than [[a]] the predefined threshold SNR to the new cluster pattern until the linear sum of the SNR of each sequentially added individual data bin exceeds [[a]] the predefined threshold SNR; and

closing the cluster pattern in response to the added computed SNR exceeding the predefined threshold SNR.

21. (Original) The method of claim 20, further comprising the step of selectively clustering the data bins comprises the step of loading each individual data bin of the cluster pattern with the same data.

22. (Currently Amended) The method of claim 3, wherein the step of ~~demodulating~~ extracting data comprises the steps of:

separating each bin-cluster into individual data bins;

applying complex weights to each individual data bin to produce weighted data bins; and

summing the weighted data bins to produce data.

23. (Original) The method of claim 22, wherein the complex weights are indicative of a maximum-likelihood estimate of the cluster payload.

24. (Original) The method of claim 22, wherein the complex weights have a unit amplitude.

25. (Original) The method of claim 22, wherein the complex weights have a non-unit amplitude.

26. (Currently Amended) In data transmission systems, a system comprising:

means for modulating data bins to produce bin-clusters, the means for modulating data bins having means for computing a signal-to-noise ratio (SNR) of each individual data bin of a plurality of data bins, means for comparing the computed SNR of each individual data bin of a plurality of data bins with a predefined threshold SNR and means for sequentially adding

individual data bins having a computed SNR not greater than a predefined threshold SNR to a bin-cluster until the linear sum of the SNR of each sequentially added individual data bin exceeds the predefined threshold SNR;

means for loading the bin-clusters with data;

means for transmitting the loaded bin-clusters;

means for receiving the transmitted bin-clusters; and

means for extracting data from the received bin-clusters.

27. (Cancelled)

28. (Currently Amended) The system of claim [[27]] 26, wherein the means for computing the SNR of each of the plurality of data bins comprises:

means for determining a noise floor of a signal transmission system;

means for determining a type of data modulation in the signal transmission system;

means for defining a desired bit-error rate (BER) associated with the signal transmission system; and

means for calculating a signal-to-noise ratio (SNR) of each individual bin of the plurality of data bins as a function of the determined noise floor, the determined type of data modulation, and the defined desired BER.

29. (Cancelled)

30. (Original) The system of claim [[29]] 26, further comprising:

means for defining individual data bins of the plurality of data bins as sufficient-capacity data bins in response to the computed SNR being greater than the predefined threshold of the comparing step; and

means for defining individual data bins of the plurality of data bins as insufficient-capacity data bins in response to the computed SNR being not greater than the predefined threshold of the comparing step.

31. (Currently Amended) The system of claim 30, further comprising:

means for beginning a new cluster pattern;

means for sequentially adding individual data bins having a computed SNR not greater than [[a]] the predefined threshold SNR to the new cluster pattern until the linear sum of the SNR of each sequentially added individual data bin exceeds [[a]] the predefined threshold SNR; and

means for closing the cluster pattern in response to the added computed SNR exceeding the predefined threshold SNR.

32. (Original) The system of claim 31, further comprising means for loading each individual data bin of the cluster pattern with the same data.

33. (Currently Amended) The system of claim 26, wherein the means for ~~demodulating~~ extracting data comprises:

means for separating each bin-cluster into individual data bins;

means for applying complex weights to each individual data bin to produce weighted data bins; and

means for summing the weighted data bins to produce data.

34. (Currently Amended) In data transmission systems, a system comprising:

a modulation device configured to modulate data bins to produce bin-clusters, the modulation device having a bin signal-to-noise ratio (SNR) calculator configured to compute the SNR of each individual data bin of a plurality of data bins, a comparator configured to compare the computed SNR of each individual data bin of a plurality of data bins with a predefined threshold SNR, and logic configured to sequentially add individual data bins having a computed SNR not greater than the predefined threshold SNR to a bin-cluster until the linear sum of the SNR of each sequentially added individual data bin exceeds the predefined threshold SNR;

a bin loader configured to load the bin-clusters with data;

a transmitter configured to transmit the loaded bin-clusters;

a receiver configured to receive the transmitted bin-clusters; and

a demodulation device configured to extract data from the received bin-clusters.

35. (Cancelled)

36. (Currently Amended) The system of claim [[35]] 34, wherein the bin SNR calculator is configured to calculate a signal-to-noise ratio (SNR) of each individual bin of the plurality of data bins as a function of the determined noise floor, the determined type of data modulation, and [[the]] a defined desired BER.

37. (Cancelled)

38. (Currently Amended) The system of claim [[37]] 34, further comprising a bin designator configured to define individual data bins of the plurality of data bins as sufficient-capacity data bins in response to the computed SNR [[bee]] being greater than the predefined threshold of the compare step, the bin designator further configured to define individual data bins of the plurality of data bins as insufficient-capacity data bins in response to the computed SNR [[bee]] being not greater than the predefined threshold of the compare step.

39. (Currently Amended) The system of claim 38, further comprising:

logic configured to begin a new cluster pattern;

logic configured to sequentially add individual data bins have a computed SNR not greater than [[a]] the predefined threshold SNR to the new cluster pattern until the linear sum of the SNR of each sequentially added individual data bin exceeds [[a]] the predefined threshold SNR; and

logic configured to close the cluster pattern in response to the added computed SNR exceeding the predefined threshold SNR.

40. (Original) The system of claim 39, further configured to load each individual data bin of the cluster pattern with the same data.

41. (Original) The system of claim 34, wherein the demodulation device comprises:

a cluster separator configured to separate each bin-cluster into individual data bins;

a cluster frequency equalizer configured to apply complex weights to each individual data bin to produce weighted data bins; and

a linear summing circuit configured to sum the weighted data bins to produce data.

42. (Original) A system for transmitting data comprising:

a bin signal-to-noise ratio (SNR) calculator configured to calculate a SNR of individual data bins in a plurality of bins;

a comparator configured to compare the calculated SNR of the individual data bins to a predefined threshold SNR;

a bin designator configured to selectively designate the individual bins as sufficient-capacity bins in response to the calculated SNR being greater than the predefined threshold SNR, the bin designator further configured to selectively designate the individual bins as insufficient-capacity bins in response to the calculated SNR being not greater than the predefined threshold SNR;

a cluster modulator configured to cluster the insufficient-capacity bins into bin-clusters for data transmission;

a cluster separator configured to separate the clustered bin-clusters into individual data bins;

a cluster frequency equalizer configured to apply complex weights to each individual data bins to produce weighted data bins; and

a linear summing circuit configured to sum the weighted data bins to produce desired data.

43. (Original) A system for transmitting data comprising:

a modulation device configured to cluster individual data bins having a low signal-to-noise ratio (SNR) to produce a bin-cluster having a higher SNR than the individual data bins; and

a demodulation device configured to produce data from the bin-clusters.

44. (Original) The system of claim 43, wherein the data transmission system is a Fourier transform-based data transmission system.

45. (Original) The system of claim 43, wherein the data transmission system is a wavelet transform-based data transmission system.

46. (Original) The system of claim 43, wherein the data transmission system is a Haar transform-based data transmission system.

47. (Original) The system of claim 43, wherein the data transmission system is a Hadamard transform-based data transmission system.

48. (Original) The system of claim 43, wherein the data transmission system is a Walsh transform-based data transmission system.

49. (Original) The system of claim 43, wherein the data transmission system is a Walsh-Hadamard transform-based data transmission system.

50. (Original) The system of claim 43, wherein the data transmission system is a Mallat transform-based data transmission system.

51. (Original) The system of claim 43, wherein the data transmission system is a Hartley transform-based data transmission system.

52. (Original) The system of claim 43, wherein the data transmission system is a discrete cosine transform-based data transmission system.

53. (Original) The system of claim 43, wherein the data transmission system is a non-wavelet transform-based data transmission system.

54. (Original) The system of claim 43, wherein the data transmission system is a trigonometric transform-based data transmission system.

55. (Original) The system of claim 43, wherein the data transmission system is a non-trigonometric transform-based data transmission system.

56. (Original) The system of claim 43, wherein the modulation device comprises:

a SNR calculator configured to calculate a SNR of individual data bins;

a comparator configured to compare the calculated SNR with a predefined threshold SNR;

a bin designator configured to selectively designate the individual bins as sufficient-capacity bins in response to the calculated SNR being greater than the predefined threshold SNR, the bin designator further configured to selectively designate the individual bins as insufficient-capacity bins in response to the calculated SNR being not greater than the predefined threshold SNR; and

a logic circuit configured sequentially add insufficient-capacity bins until the linear sum of the individual bins exceeds the predefined threshold SNR.

57. (Original) The system of claim 43, wherein the demodulation device comprises a cluster separator configured to separate bin-clusters into individual data bins.

58. (Original) The system of claim 57, further comprising a cluster frequency equalizer configured to apply a complex weight to the individual data bins to produce weighted data bins.

59. (Original) The system of claim 58, wherein the complex weight is indicative of a maximum-likelihood estimate of the cluster payload.

60. (Original) The system of claim 58, wherein the complex weight has a unit amplitude.

61. (Original) The system of claim 58, wherein the complex weight has a non-unit amplitude.

62. (Original) The system of claim 58, further comprising a linear summing circuit configured to selectively add the weighted data bins to produce data.

63. (New) The system of claim 43, wherein the demodulation device comprises:

a SNR calculator configured to calculate a SNR of individual data bins;

a comparator configured to compare the calculated SNR with a predefined threshold SNR;

a bin designator configured to selectively designate the individual bins as sufficient-capacity bins in response to the calculated SNR being greater than the predefined threshold SNR, the bin designator further configured to selectively designate the individual bins as insufficient-capacity bins in response to the calculated SNR being not greater than the predefined threshold SNR; and

a logic circuit configured sequentially add insufficient-capacity bins until the linear sum of the individual bins exceeds the predefined threshold SNR.